A Comprehensive Approach to Biomass in California

Comments by IHI Power Services
Public Workshop to discuss Fuels and Infrastructure for a Carbon Neutral Economy

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Summary & Recommendations

California has a biomass problem. The Lawrence Livermore National Laboratory (LLNL) report, "Getting to Neutral," estimates that the state generates over 50 million bone dry tonnes of biomass per year from agricultural, forest management, and municipal sources.[1] Today, most of the carbon in these resources, nearly 100 MMT CO_2, is returned to the atmosphere every year through decay or – too often – wildfire and open burning. Along with burning comes significant particulate and black carbon pollution and associated health impacts, which are especially concentrated in the Central Valley. Indeed, current biomass power plants – with pollution controls – put less than 10 percent of this resource to beneficial use.[2]

California also has a biomass opportunity. The same LLNL report estimates that putting this waste resource to beneficial use in about 50-100 facilities with carbon capture and sequestration (CCS) could provide greenhouse gas benefits of 143 $MMTCO_2$/year, or about one-third of current statewide emissions, at an average cost of about \$32/$MTCO_2$, as soon as 2025.[3] Delivering on this promise would be transformative in the state's fight against climate change and pursuit of climate neutrality.

We encourage the state to develop a comprehensive Biomass Action Plan for addressing the biomass problem and capturing the tremendous biomass opportunity as soon as possible. Such a plan could build on the previous multi-agency *Bioenergy Action Plan,*[4] but with a broader and renewed focused based on the urgency of addressing wildfire risk in the state, improving air quality and public health, managing biomass waste, and achieving climate neutrality and net-negative greenhouse gas emissions as soon as possible. This plan could be developed over the next year and feed into the Scoping Plan.

As part of this plan, and through additional, targeted policies, the state should support the continued operation of its remaining biomass power plants, to keep from making the biomass problem worse, and use them to demonstrate and scale the evolution of the biomass industry in California – to begin to capture the tremendous biomass opportunity. In particular, the state should extend biomass energy contracts for existing facilities and do so in a manner that supports near-term investments in improved local air quality and longer-term investments in upgrading facilities to include CCS and demonstrate new technologies like gasification or pyrolysis.

IHI Power Services is proud to operate three biomass power plants in California that annually divert about 600,000 dry tons of biomass from the landfill or burn pile and help California

improve air quality and meet its climate objectives. We are ready to invest in these facilities to upgrade their emissions controls, demonstrate next-generation technologies to capture the opportunities highlighted in the LLNL report, and help California achieve climate neutrality and net-negative emissions. We appreciate the opportunity to comment on the "Fuels and Infrastructure for a Carbon Neutral Economy" workshop and look forward to continuing this conversation with CARB and the state.

Benefits of Biomass Utilization

Currently, there are 21 biomass plants in California, providing just under 600 MW of renewable energy to the state. By diverting organic waste from agricultural, municipal and forest sources and using it to generate renewable electricity, these plants ensure that environmentally detrimental practices such as open burning are avoided. While biomass plants are generally evaluated on the cost of the price of the electrons they generate, these valuations do not capture the numerous societal benefits that they bring beyond renewable energy. These include:

- **Health Benefits:** Biomass plants are integral in achieving state goals for pollutants under the 1990 Clean Air Act Amendments. A retroactive study of this law estimates the average California health benefits to equal nearly $8 billion per year.

- **Wildfire Prevention:** Biomass plants have been called upon to aid in the management of the vast number of beetle-killed trees throughout the state, which represent a significant wildfire threat. Increased utilization of biomass for forest fire prevention will help reduce forest fires, and their costs – in lives and in dollars.

- **State Landfill Diversion Goals**: Under SB 1383, California has set a statewide goal of reducing organic waste in landfills by 75%. Removing organics such as biomass materials from the landfill is a critical component to achieving this goal.

- **Best Solution for Agricultural Biomass Disposal**: Turning agricultural biomass waste, estimated to be 10.4 million bone dry tons annually in 2025,[5] into useful energy, while at the same time minimizing pollution from open burning, is critical to maintaining air quality in the Central Valley.

- **Black Carbon Reductions:** Wildfires and biomass open burning are the largest source of black carbon emissions in California, which as a component of particulate matter is the ultimate super pollutant - claiming millions of lives globally per year and exerting a profound impact on climate change in the near term.[6] Getting excess biomass out of the forest and off farms where it would otherwise open burn is most important step the state can take to reduce black carbon emissions.

- **Water and Watershed Benefits:** California's forests are overgrown and utilize water that was historically available for other uses. Biomass is a key component of preventing forest

overgrowth. Proper forest density management is estimated to increase water availability by 4.8 million acre-feet annually or an approximate tripling of the current water supply to the California Water Project.

- **Provides Reliable, Baseload Power:** Baseload power is necessary to manage the grid given the intermittency of renewables such as wind and solar. Biomass plants are critical infrastructure, providing this baseload energy.

- **Local Economic Benefits:** Biomass generation facilities provide more jobs per unit of generation than any other renewable technology. Additionally, the vast majority of biomass facility expenditures are within a 60- to 100-mile radius of the facility, providing further economic benefit.

- **Local Tax Base Benefits:** Cities and Counties benefit from taxes paid by biomass value-chain operations. During the current COVID-19 pandemic where a substantial amount of taxes is lost, it is critical that industries such as biomass continue to operate and contribute to local economies.

Biomass Critical for Achieving Carbon Neutrality

As mentioned above, the LLNL report highlights bioenergy with CCS (often referred to as BECCS) as one of the most promising, significant and cost-effective strategies to help California achieve its carbon neutrality and negative emissions goals. The report specifically identifies biomass gasification with CCS to produce hydrogen for use in the transportation sector as a promising technology, but also suggests that biomass combustion with CCS to produce electricity could offer similar, if just slightly less, emissions benefits and cost effectiveness. (Note these findings are not a function of the cost of the technology itself – gasification-to-liquid hydrogen is a more costly pathway to market – but rather assumptions about expected revenues and the value and carbon intensity of the products BECCS would replace on the market.)

Since it is unlikely that a one-size fits all approach will ultimately be best to address the state's entire biomass feedstock, and since tremendous uncertainty remains about the ultimate scope and timing for hydrogen markets in the transportation sector, biomass combustion could remain an important strategy for cost effectively handling waste biomass in the state for decades to come. And regardless of the ultimate technology used, or markets targeted, existing or shuttered biomass facilities are well situated to help quickly capture this opportunity and evolve to utilize emerging technologies and reach new markets.

Importantly, the report identifies the same scale of opportunity and the same costs for BECCS in California in both 2025 and 2045, suggesting the state should not wait to quickly scale its vision and approach towards biomass to capture these opportunities.

Existing Plants Can Contribute to the Future of Biomass

As noted in the LLNL report, there are a variety of promising technologies on the horizon that will convert waste biomass into fuels and store carbon dioxide. These include conversion of waste biomass to liquid fuels through pyrolysis and to gaseous fuels through gasification. However, our experts believe it will take five to ten years for these technologies to be consistently reliable and affordable enough to reach the scale envisioned in the report. In order to get to implementation of these technologies while still dealing with the active waste streams of organic material, the state should move to preserve the existing biomass fleet. In particular, to fully support the potential of the new biomass technologies, the state should enact policies that support the existing biomass facilities through runway contracts that span five to ten years. This will provide the off-ramp needed for new technologies to scale up and for existing plants to transition to the newest technologies.

By utilizing existing plants and supporting their continued operation, the state can avoid additional open burning and exacerbating existing the current biomass problem, while supporting new investments in additional air quality improvements and new technologies like CCS, gasification, or pyrolysis. These plants are already well-sited relative to existing biomass resources, and are well situated to anchor and demonstrate a new, net-negative emissions biomass paradigm for California. With existing footprints and interconnections, utility-scale biomass plants are unique opportunities to install and showcase new technologies without having to break new ground. The state should view existing biomass plants as an asset that can be used to continue to address organic waste diversion, air quality, short-lived climate pollutant and renewable energy goals, while providing a footprint which can support new technologies to transition away from the combustion-to-energy model. Maintaining and modernizing these facilities can also serve as important opportunities to support just transitions for fossil-fuel workforces and provide economic opportunities in hard-hit rural and low income communities. As one of the largest operators of biomass plants in the state, IHI would like to be a leader in this effort.

Making Existing Plants Better

Any extension of contracts for the existing biomass fleet should only be completed with a clear pathway towards the future state. New contracts for existing facilities should require improvements to the best-available retrofit control technologies or offsetting equivalent emissions. Runway contracts will also provide the biomass industry with the certainty needed to make capital improvement investments in next-generation biomass technologies that are more immediately available. Such technologies include biomass combustion with CCS and hybridizing plants with energy storage technologies. These types of investments will present opportunities for job creation, making them ideal targets for any stimulus initiatives that may result from federal allocations or other funding streams.

Preserving the existing fleet will allow those plants to provide support for the cultivation of newer technologies. Because these sites have an existing footprint, they do not require the

permitting, acquisition of new land or new connections to the grid, thereby sparing potential new technologies from many of the challenges that would be required to bring a new project online. Additionally, utility-scale biomass plants have established networks for the collection and transportation of fuel, which generally take a long time to create from scratch. These dynamics create a unique opportunity for the state to leverage existing footprints to not only preserve existing jobs but foster the development of new technology projects on sites that already have the infrastructure needed to make those projects successful.

Coordinated Plan Needed to Achieve Maximum, Quickest Benefits

Ultimately, achieving the climate benefits identified in the LLNL report will require a coordinated plan to match waste biomass supplies with off-takers, energy facilities, and markets, as well as developing a statewide plan for CCS at scale. The state should develop a *Biomass Action Plan*, which should be flexible to accommodate market conditions that could affect either the supply of biomass, or end use markets. The plan should identify clear goals, priorities, recommendations, and facilitate private sector investments to accelerate progress.

Development of the Plan could be led by the California Natural Resources Agency, CARB, CEC, and CalEPA. Effectively, this plan would be a successor to previous versions of the Bioenergy Action Plan, but with new focus on achieving carbon neutrality while supporting the state's priorities around equity, air quality, forest management, organics diversion and short-lived climate pollutants, SB 100 and carbon removal. The plan should be completed by 2021, so that it can feed into the next draft of CARB's Scoping Plan.

Other Supportive Implementation Opportunities

Finally, while contracts and planning are key to facilitating the transition of traditional biomass plants to newer technologies, there are a variety of existing and potential state programs that can also facilitate and accelerate this evolution. These programs include:

- **Low Carbon Fuel Standard**: With numerous pathways that can generate revenue for biomass plants, the LCFS program can play a critical role in the evolution of the biomass industry. The electrification of fleets, especially heavy-duty bus and truck fleets, and the creation of biomass-to-fleet pathways would be an important development for the industry. A pathway for biomass with direct air CCS can also be a crucial new tool for the biomass industry.

- **Short Lived Climate Pollutant Goals**: The air quality and organic waste diversion goals laid out in SB 1383 dovetail nicely with the natural activities of biomass plants and any successor technologies. By providing an alternative fate for biomass waste that would otherwise be open burned, biomass plants have long contributed to air quality improvements in their communities, especially in the Central Valley. The creation of a biomass-focused policy framework, nested within the larger SB 1383 framework, that

leverages the strengths of biomass plants will help the state achieve its organic waste diversion goals even faster.

- **Renewable Gas Standard:** The creation of a renewable gas standard will be critical for the commercial success of gasification technologies. Such a standard should set ambitious goals for renewable gas procurement and would support numerous technologies and goals, including air quality and short-lived climate pollutant goals, biomass waste management, greenhouse gas reductions in hard-to-abate sectors, and economic growth.

- **Direct Incentives**: The use of direct incentives can catalyze the transition to next-generation technologies. Federal stimulus dollars, should they materialize, would be an ideal source for incentives. While the COVID-19-induced recession has resulted in significant declines in the state's various revenue streams, the economy will eventually rebound. Once it does, potential sources of direct incentives include utility programs, Cap-and-Trade and tipping fees.

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[1] Baker, S.E. et al. (2020) Getting to Neutral: Options for Negative Carbon Emissions in California (Revision 1), Lawrence Livermore National Laboratory, LLNL-TR-796100, August. https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf

[2] Based on CalRecycle's SB 498 Reporting, 25 active biomass facilities accepted 4.1 million tons of biomass in 2018, or about 7.5 percent of the estimated 54 million tons available in 2025 identified in the LLNL report. https://www2.calrecycle.ca.gov/Docs/Web/116706

[3] For example, see Table 40 in the LLNL report cited in reference 1

[4] O'Neill, Garry (2012) 2012 Bioenergy Action Plan, California Energy Commission. https://resources.ca.gov/CNRALegacyFiles/docs/energy_and_climate_change/2012_Bioenergy_Action_Plan.pdf

[5] Baker, S.E. et al. (2020) Getting to Neutral: Options for Negative Carbon Emissions in California (Revision 1), Lawrence Livermore National Laboratory, LLNL-TR-796100, August. https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf

[6] CARB (2017) Short-Lived Climate Pollutant Reduction Strategy, California Air Resources Board, March. https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf